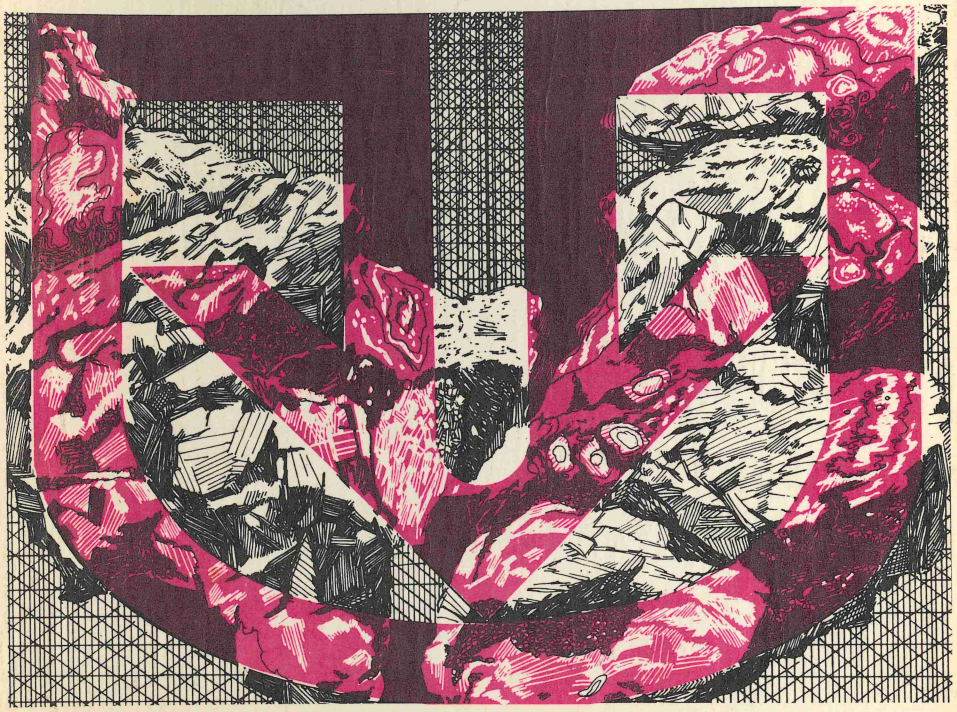
MINERALS THAT FLUORESCE WITH MINERALIGHT® LAMPS



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AN INTRODUCTION TO FLUORESCENT MINERALS

Rock collectors were the first ultraviolet hobbyists. Some were professional minerologists, others were businessmen, and much of the present day industrial and scientific importance of ultraviolet light and fluorescence is due to these hobbyists.

Today increasing numbers of men and women, young and old, are engaged in the ultraviolet hobby -- not so much for personal gain as for personal recreation. It is not unusual to enter a private home and find a fluorescent mineral collection on a par with some of the finest museums. And many of these hobbyists speak with authority about ultraviolet light and fluorescence, having found the theory behind their hobby as fascinating as the hobby itself.

Ultraviolet Light

Ultraviolet light is divided into two classes: short wave and long wave. Short wave ultraviolet is located at 1,800 to 3,000 Angstrom units. It is not found in sunlight reaching the earth and can be secured only from artificial sources. The ability of short wave ultraviolet to cause fluorescence is what makes it so valuable in the detection of minerals.

Long wave ultraviolet lies in the range of 3,000 to 4,000 Angstrom units. It fluoresces a number of minerals and creates brilliant fluorescence in many chemicals and dyes. Visible light rays are between 4,000 and 7,000 Angstrom units.

The Filter Fallacy

A fairly persistant but totally incorrect idea exists that anyone can make an ultraviolet lamp by merely placing a blue glass filter over a regular light bulb. Not true.

The purpose of the special ultraviolet filter is to absorb radiation and hold back visible light emitted from the ultraviolet source. It does not create or change the wavelength coming from the source. The ultraviolet filter absorbs wavelengths longer than 4,000 Angstroms but permits passage of the shorter and invisible ultraviolet wavelengths. Obviously, unless the ultraviolet wavelengths are present at the lamp source, no type or amount of filters can create them and there will be no fluorescence.

Ultraviolet lamp filters transmit a small amount of purple light while absorbing all other visible light. The ultraviolet wavelengths pass through easily and are responsible for any fluorescence. Because of the trace of purple light, there may be doubt at times whether a mineral is fluorescent or merely reflecting the light. A simple test is to place a piece of glass between the lamp and the mineral. If the color persists, it is reflection. If the fluorescence stops, the glass has blocked the ultraviolet energy and the mineral is a fluorescent specimen.

Unlike long wave filters which remain constant, short wave filters solarize with time and gradually lose their transmitting ability after several hundred hours of use. They should be replaced from time to time to maintain peak fluorescing ability.

Best fluorescence is found after the eyes are dark-adapted and the examination is made in a darkened area. Prospecting and mineral examinations on field trips should be done at night.

Seeing with Ultraviolet

MINERALIGHT and BLAK-RAY® Lamps reverse the usual basis of seeing when studying minerals. Under normal lighting conditions, the human eye examines objects by reflected light. All objects absorb some of the light directed at them and reject certain wavelengths. The rejected wavelengths are the colors seen.

In the case of fluorescence, there is practically no visible light from the ultraviolet source. The object that is fluorescent becomes the source of light and color, and even the smallest specks -- invisible in reflected light -- can be seen. This means fluorescent specimens can be seen with great clarity, often at a considerable distance because the surrounding material does not fluoresce or reflect. Only the fluorescent mineral is seen in sharp contrast to the various non fluorescent minerals around it. Distance from which the fluorescence may be seen depends on the intensity and size of the lamp -- from 10 or 15 feet to as much as 60 or 100 feet.

The Alzak reflector used in all MINERALIGHT and BLAK-RAY Lamps is vital in effective night prospecting. The reflector is curved to project the greatest possible amount of ultraviolet in the best beam possible. This is of great importance: beaming concentrates the ultraviolet light and causes the activated minerals to fluoresce their strongest.

Activators

Fluorescence in many minerals is due to the presence of some impurity. This impurity is usually so small that it can be determined only by the use of a spectrograph. These impurities which cause the fluorescence of most minerals are termed activating agents or activators.

In simplest terms, it works like this:
All matter is made of atoms. All atoms are made of electrons which orbit around a nucleus like the planets in the solar system. In many minerals, if these electrons are exposed to ultraviolet, they absorb the energy, move violently, and jump outward from their normal orbit. As they leave their orbit, another electron is pulled down from its orbit to maintain the electrical balance. This movement produces energy and it is this energy which is seen as fluorescence or visible light. Fluorescence occurs only while the material is being activated by ultraviolet.

For example, calcite under normal conditions does not fluoresce but should a minute trace of manganese be present as an activator, the calcite will fluoresce red. If the percentage of manganese is less than one percent or more than five percent, it will not act as an activator and there will be no fluorescence.

Other minerals also display uniquely beautiful fluorescence because of traces of an activator. Various rocks containing uranium salts fluoresce green. Scheelite, from which valuable tungsten is obtained, glows a bright blue in its pure form, but fluoresces white to yellow if molybdenum is present in varying quantities.

The list of color variations is almost as long as the list of fluorescent minerals. And adding to the mineral intrigue, minerals that fluoresce from one area may not be fluorescent from another area, or they may even fluoresce a different color. The type of ultraviolet light is also a factor. Minerals that fluoresce under a short wave MINERALIGHT Lamp may change color or have no fluorescence at all under a long wave BLAK-RAY Lamp.

Obviously, the possibilities are endless. All you basically need is a short wave or multiband MINERALIGHT Lamp, darkness, and a strong sense of curiousity, adventure, and discovery.

Phosphorescence

Phosphorescence is the ability of a material to retain some of the energy which it receives and to release this energy in the form of visible light, not only during the period of activation when it is called fluorescence, but also to continue releasing this energy after the activating source has been removed. This released radiation following the period of activation may persist for periods from a quarter-second to a matter of many hours. The light given off during phosphorescence is dim compared to fluorescence.

Rare Earths

Valuable rare earths can be detected and recognized under an ultraviolet lamp with the filter removed. Rare earths are recognized by dull to emerald green color that contrasts markedly with the surrounding area. These rare earth minerals are totally non fluorescent. Minerals which show green and are also fluorescent cannot be rare earth minerals.

The green color seen without filter is not fluorescence. It is an optical effect caused primarily by neodymium, a cerium group rare earth which absorbs yellow light plus most of the blue and violet rays, and reflects the green.

Beyond Minerals

There's more than minerals to the incredibly beautiful world of fluorescence. When out on field trips, look for such things as fluorescent fungus, petrified wood, and fluorescent living wood. Several varieties of the latter glow vividly under MINERALIGHT Lamps -- Black Locust, Sumac, Oregon Grape root, and many others fluoresce to make them interesting household decorative accessories.

In the home, a fascinating tour can be made looking at everyday rooms and objects with a MINERALIGHT Lamp. Inspect the kitchen, closet, medicine chest -- the number of humdrum items that spring to brilliant fluorescent color will amaze you.

FLUORESCENT MINERALS

This listing is designed to help you identify your minerals and, we hope, encourage you to explore your locale more thoroughly for these truly beautiful specimens. Fluorescent minerals are everywhere -- from the beaches of Lake Superior to the deserts of California. With a lamp and a little luck and endurance, you'll find them.

The list of minerals described is quite extensive, but it is not to be considered complete. Sterling Gleason's book, "Ultraviolet Guide to Minerals," includes a far more comprehensive list.

The selection listed here is believed to be sufficient to be practical, in addition to including many minerals not included in Gleason's fine book. No attempt is made to list all localities where these minerals may be found. In most cases, it would be possible to greatly extend the number of areas.

We leave it to you to add new and more important localities to those mentioned. Minerals are listed alphabetically with some identifying information. A list of colors and the minerals which may respond to these colors is also included.

ADAMITE

A secondary zinc mineral found in crusts of fine crystals often in beautiful formations. Yellowish blue green. Usually will lose fluorescence on heating.

Locations: Mapimi, Mexico; Lavrium, Greece; etc.
S. W. fl: Green
L. W. fl: Green
Phos: Seldom
Hardness: 2-1/2 Sp. gr: 4.35 - 4.34
Chem. comp: Hydrous zinc arsenate $4ZnO\ As_2O_5H_2O$

AGATE

Activator in the agate is a uranium salt and fluorescence is variable with the presence of the activator. Transparent to translucent form of quartz. Frequently occurs on cleavage lines and lining rock cavities as in geodes and as chalcedony roses.

Locations: Canada; U. S. ; Mexico and worldwide
S. W. fl: Green, varies light to dark
L. W. fl: Some, but less bright than with S. W.
Phos: -
Hardness 7 Sp. gr: 2.64 to 2.6
Chem. comp: Silicon dioxide S_1O_2

ALBITE

A form of feldspar. Pockets of albite are found in Crestmore Quarry and occasionally there is a green fluorescence from a kaolinized variety. White to gray, reddish, yellow or green. After heating intensely the fluorescence is often a bright blue.

Locations: Crestmore, Calif. ; Newry, Maine; Branchville, Conn. ; Bedford, N. Y. ; Amelia Court House, Va. ; etc.
S. W. fl: White or green
L. W. fl: Golden brown to pale orange
Phos: White S. W.
Hardness: 6. - 6.5 Sp. gr: 2.65 - 2.62
Chem. comp: Sodium aluminum feldspar $Na_2O\ Al_2O_3\ 6Si\ O_2$

ALLOPHANE

Variable fluorescent response must be due to varieties of activators absorbed in the basic material. Daytime color blue to yellow.

Locations: Mammoth Cave, Ky. ; Resin Hollow, Ky. ; Steinmetz Hungary; etc.
S. W. fl: Green, cream-white, pale brown
L. W. fl: -
Phos: -
Hardness 3. Sp. gr: 1.89 - 1.85
Chem. comp: Hydrous aluminum silicate $AL_2\ SiO_5\ SH_2O$

ALUMINITE

Not a normally fluorescent mineral. Most localities have not reported fluorescence. Found in clay. Easily powdered. White.

Locations: Saxony (England) etc.
S. W. fl: White
L. W. fl: -
Phos: White
Hardness: 1.2 Sp. gr: 1.66
Chem. comp: Hydrous aluminum sulphate $AL_2O_3\ SO_3\ 9H_2O$

ALUNITE — Not normally a fluorescent mineral. White to grayish.

Locations: Marysville, Utah, etc.
S. W. fl: Grayish white
L. W. fl: Orange
Phos: -
Hardness: 3-1/2 - 4 Sp. gr: 2.75 - 2.58
Chem. comp: Hydrous aluminum potassium sulphate $KAl_3(SO_4)_2(OH)_6$

AMAZONITE — Occasional specimens only are fluorescent. Colors of white, pale yellow, red or green.

Locations: Mammoth Cave, Ky.; Resin Hollow, Ky.; Steinmetz, Hungary; Pikes Peak, Colo.; etc.
S. W. fl: Green, cream white, pale brown
L. W. fl: -
Phos: -
Hardness: 6 - 6.5 Sp. gr: 2.57 - 2.54
Chem. comp: Potassium aluminum feldspar $K_2O.AL_2O_3 6SiO_2$

AMBER (Succinite) — A fossil resin sometimes found in lignite and other fossil material. Not always fluorescent. Usually yellow, brownish or white.

Locations: Pennsylvania, Maryland, Colorado and Texas. Prussia and Baltic Sea areas.
S. W. fl: Gray-blue, yellow
L. W. Fl: White, yellow, green
Phos: -
Hardness: 2 - 2-1/2 Sp. gr: 1.10 - 1.05
Chem. comp: A hydrocarbon

AMBLYGONITE — Colorless, white to gray, blue to yellow. After heating becomes white and fluoresces white S. W.

Locations: Keystone, S. D.; Harding, New Mex.; Pala, Calif.; etc.
S. W. fl: White
L. W. fl: Pale brown to weak orange
Phos: Light blue L. W. and S. W.
Hardness: 5-1/2 - 6 Sp. gr: 3.09 - 3.01
Chem. comp: Lithium aluminum fluoro-phosphate $LiF.ALPO_4$

AMETHYST — A form of quartz. Most specimens do not fluoresce but those from these areas uniformly fluoresce blue. Crystal structure typical of quartz. Color - purple.

Locations: Madagascar, North Carolina, etc.
S. W. fl: deep blue
L. W. fl: deep blue
Phos: -
Hardness: 7 Sp. gr: 2.6 - 2.5
Chem. comp: Silicon dioxide ($Si O_2$)

ANGLESITE — Occurs in banded gray or white masses, often with black coating. Very brittle. Gray or white when pure but often with tints of yellow blue or green. Heavy.

Locations: Black Hills, So. Dak.; Lead Hills, Scotland.
S. W. fl: Yellow to cream-white
L. W. fl: Yellow-orange
Phos: -
Hardness: 3 Sp. gr: 6.39 - 6.12
Chem. comp: Lead sulphate $PbSO_4$

APATITE — Usually fluorescent when from acidic rocks such as granites and granite pegmatites. Presence of heavy metals such as iron may cause loss of fluorescence. Non-fluorescent specimens will usually fluoresce orange after strong heating.

Locations: Saxony, Germany; Kurokura, Japan; Hull, Que., Canada; Franklin, N. J.; Bancroft, Ont., Canada.
S. W. fl: Lemon-yellow, orange, gray-green
L. W. fl: Yellow, dull pink
Phos: -
Hardness: 5 Sp. gr: 3.23 - 3.17
Chem. comp: Calcium fluorophosphate $Ca_5(Cl, F)(PO_4)_3$

ARAGONITE — A form of calcium carbonate with a distinctive crystal structure that separates it from calcite. Very widely distributed world wide. Fluorescent colors due to impurities. Tan to white. Usually loses its fluorescence after heating.

Locations: Rawlins, Wyo.; Crestmore, Calif.; Death Valley, Calif.; Kingman, Ariz.; Franklin, N. J.; etc.
S. W. fl: Yellow-orange, greenish-white, pale blue, cream
L. W. fl: White to cream, orange
Phos: Variable to both L. W. and S. W.
Hardness: 3.5 Sp. gr: 2.99 - 2.93
Chem. comp: Calcium carbonate ($Ca CO_3$)

AUTUNITE — A yellowish coating on pegmatite granules, a yellowish deposit in clay or sandstones. It is a secondary uranium mineral and one of the few with a bright fluorescence which serves as a basic test.

Locations: White Mts., New Hampshire; Newry, Me.; Mitchell Co., N. C.; Spokane, Wash.; Kane Co., Utah; Wamsutter, Wyo.; Taft, Calif.; etc.
S. W. fl: Yellow-green
L. W. fl: Yellow-green
Phos: -
Hardness: 2-2-1/2 Sp. gr: 3.19 - 3.05
Chem. comp: Hydrous calcium uranium phosphate $Ca(UO_2)_2(PO_4)_2.12H_2O$

AXINITE

Occurs in the zinc mines of Franklin, N. J. Considered one of the rare minerals from that location. Usually dull yellow-tan. Tabular xls fluoresce strong deep red.

Locations: Franklin, N. J.
S. W. fl: Red
L. W. fl: Red
Phos: -
Hardness: 6-1/2 - 7 Sp. gr: 3.29 - 3.27
Chem. comp: A boro-silicate of aluminum and calcium. $HCa_2(Fe,Mn)Al_2B(SiO)_4$

BARITE

Often phosphorescent. Commonly occurs in flat crystals, opaque to transparent. Very heavy. After roasting may have a bright orange fluorescence. Barite from Franklin blue or cream white - not phos. - SW only.

Locations: Palos Verde, Calif.; Cheyenne River, S. D.; Cumberland, England; Franklin, N. J.; Bad Lands, S. D.; etc.
S. W. fl: All shades of white
L. W. fl: Whitish
Phos: Yellowish-white, greenish white, bluish-green
Hardness: 3 Sp. gr: 4.6 - 4.3
Chem. comp: Barium sulphate $BaSO_4$

BENITOITE

Found in only one location at the top of the Coast range in San Benito County, Calif. Occurs with neptunite and natrolite. Can be faceted into beautiful gems. Dark blue to colorless.

Locations: San Benito County, Calif.
S. W. fl: blue
L. W. fl: -
Phos: -
Hardness: 6 - 6-1/2 Sp. gr: 3.65 - 3.64
Chem. comp: Barium titano-silicate $BaO.TiO_2 3SiO_2$

BERYL

Beryl is rarely fluorescent and such response must be due to an impurity in a localized area. Greenish - also other colors.

Locations: Colorado & New Mexico; East Wakefield, N. H.
S. W. fl: Faint green - weak yellow
L. W. fl: Faint peach
Phos: -
Hardness: 7-1/2 - 8 Sp. gr: 2.8 - 2.63
Chem. comp: Beryllium, aluminum silicate $2BeO.Al_2O_3 6SiO_2$

BORAX

Found in the borax deposits in Searles Lake. The crystals are never brightly fluorescent. Have brighter phosphorescence than fluorescence. Dissolves readily in water. Colorless when moist; white when dry.

Locations: Searles Lake, Calif.
S. W. fl: Blue-green
L. W. fl: Blue-green
Phos: Blue-white
Hardness: 2 - 2-1/2 Sp. gr: 1.72 - 1.69
Chem. comp: Hydrous sodium borate $Na_2B_4O_7 10H_2O$

BRUCITE

Rather transparent - fluorescence is a final means of identification - may be foliated - massive - fibrous - softer than mica.

Locations: Brewster, N. Y.; Lancaster County, Penna.
S. W. fl: Blue
L. W. fl: -
Phos: -
Hardness: 2.5 Sp. gr: 2.4
Chem. comp: Magnesium hydroxide $Mg(OH)_2$

CALAMINE

See Hemimorphite

CALCITE

A form of calcium carbonate distinguished from Aragonite by its crystal form. Calcite is the most spectacular and most widely distributed of all fluorescent minerals. Not all calcites fluoresce, but certain impurities or activators cause every possible shade of fluorescent colors. The calcites of New Jersey have a brilliant red fluorescence with a very transitory deep red phosphorescence. The calcite from Texas fluoresces pink and blue and phosphoresces blue. A great variety of colors characterize the California calcites as well as most of those of the Western States. In some instances the fluorescent calcite may appear in limestone similar to scheelite. It is never as brilliant as scheelite and usually the granular appearance distinguishes it from the more crystalline structure of scheelite. Calcite is softer than scheelite and scheelite is not phosphorescent. Colorless, white or pale tints of all colors. Many non-fluorescent specimens will become fluorescent after heating.

Locations: Terlingua, Texas; Franklin, N. J.; Mt. Hollywood, Calif.; Tres Hermanos Mts., New Mex.; Joplin, Mo.; etc.
S. W. fl: Blue, red, yellow-orange, cream, pink, white to yellow
L. W. fl: Pink, many pastel shades
Phos: Blue, red, pink, yellow, white
Hardness: 3 Sp. gr: 2.72 - 2.71
Chem. comp: Calcium carbonate $CaCO_3$

CALCIUM LARSENITE See Esperite

CALICHE

This is a secondary, water deposited form of various leached minerals that often fluoresces. It is only a coating. Commonly found throughout the Western U. S. Color of fluorescence highly variable. Daylight color dull white to yellowish dirty brown.

Locations: Desert areas
S. W. fl: Fl. whitish (shades of cream, yellow, orange, pink, green or blue)
L. W. fl: -
Phos: Whitish
Hardness: 2 or less Sp. gr: 2.29 - 2.24
Chem. comp: Calcium carbonate, soda nitrate, calcium phosphate (Variable composition, not a mineral)

CALOMEL — A secondary mercury mineral, commonly fluorescent L.W. Whitish, yellowish, brown.

Locations: El Doktor, Mexico; Terlingua, Texas
S.W. fl: -
L.W. fl: Red to pink
Phos: -
Hardness: 1 - 2 Sp. gr: 6.48
Chem. comp: Mercurous chloride Hg_2Cl_2

CELESTITE — Specimens from Clay Center and Sicily are the only ones recognized as having fluorescence at this time. Phosphorescence bright by comparison to fluorescence. Light blue - colorless - whitish. After firing with whitening of the surface, fluoresces and phosphoresces bright green.

Locations: Clay center, Ohio; Sicily
S.W. fl: White, greenish-white
L.W. fl: White
Phos: White, greenish-white
Hardness: 3 - 3-1/2 Sp. gr: 3.97 - 3.95
Chem. comp: Strontium sulfate Sr. SO_4

CERUSSITE — A secondary mineral, often in fragile, fibrous white crusts of loosely consolidated needles. Often fluorescent.

Locations: New Mexico, Arizona
S.W. fl: Yellow
L.W. fl: -
Phos: -
Hardness: 3 - 3.5 Sp. gr: 6.5 - 6.6
Chem. comp: Lead carbonate Pb CO_3

CHALCEDONY — See Agate

CHLORAPATITE — A black rock with nearly solid yellow orange fluorescence. Black and grainy.

Locations: Taylorsville, Calif.
S.W. fl: Orange, yellow
L.W. fl: -
Phos: -
Hardness: 4-1/2 - 5 Sp. gr: 3.20
Chem. comp: Chlorine bearing apatite or calcium chloro-phosphate $3Ca(PO_4)_2CaCl_2$

CHONDRODITE — Usually occurs in the limestones of Northern, N.J. and into New York State. Usually a tan or light yellow.

Locations: Sparta, N.J.; Brewster, N.Y.
S.W. fl: Yellow to tan
L.W. fl: -
Phos: -
Hardness: 6 - 6-1/2 Sp. gr: 3.2 - 3.1
Chem. comp: Fluorosilicate of magnesium Mg (F, $OH)_2$

CLINOHEDRITE — Similar in fluorescent color to pectolite from Franklin, N.J. Usually appears as a coating over large masses of Willemite and Franklinite. Amethystine translucent glassy crystals.

Locations: Franklin, N.J.
S.W. fl: Strong Orange
L.W. fl: Weaker orange
Phos: Orange S.W.
Hardness: 5.5 Sp. gr: 3.33
Chem. comp: Hydrous calcium zinc silicate ZnO. CaO. SiO_2 H_2O

COLEMANITE — A water insoluble form of borax, usually in a crystalline form. Variable fluorescence. White to yellow.

Locations: Death Valley, Calif.; Calico Hills, Calif.; etc.
S.W. fl: White to cream yellow
L.W. fl: Faint white
Phos: Cream to blue-white
Hardness: 4 - 4-1/2 Sp. gr: 2.43 - 2.42
Chem. comp: Hydrous calcium borate $2CaO.3B_2O_3\ 5H_2O$

CORUNDUM — Occurs in pockets in limestone. It is usually easily distinguished by red color. Usually small red crystals but almost always purple from Franklin.

Locations: Ogdensburg, N.J.; No. Carolina; etc.
S.W. fl: Faint red or orange
L.W. fl: Strong ruby red
Phos: -
Hardness: 9 Sp. gr: 4.1 - 3.95
Chem. comp: Oxide of aluminum Al_2O_3

CUPROSCHEELITE — A rather unusual form of calcium tungstate or scheelite. Has the well defined hard structure comparable to scheelite. Basically yellow with a greenish cast.

Locations: Darwin, Calif.; Milford, Utah; Plumas County, Calif.; etc.
S.W. fl: Greenish yellow
L.W. fl: -
Phos: -
Hardness: 5 Sp. gr: 6.1 - 5.9
Chem. comp: Cuprian calcium tungstate $CaWO_4$ (Cu)

CURTISITE — Occurs commonly only in the mercury deposits of the Skaggs Springs, Calif. area. Since these mines are closed the mineral is rarely available. Occurs in seams as a cream yellow deposit that smears readily.

Locations: Skaggs Springs, Calif. and rarely in other mercury deposits in Calif.
S.W. fl: Yellow or greenish
L.W. fl: Yellow or greenish
Phos: -
Hardness: Soft Sp. gr: 1.21
Chem. comp: A hydrocarbon $C_{24}H_{18}$

DEWEYLITE — A soft mineral similar to serpentine in composition. Sometimes occurs as a waxy mass. Is quite crumbly. White.

Locations: Cedar Hill, Pa.; Newcastle Co., Dela.; Bare Hill, Md.; etc.
S. W. fl: Bluish, white
L. W. fl: Cream, white
Phos: slightly
Hardness: 2 - 3 Sp. gr: 2.2 - 2.0
Chem. comp: A hydrous magnesium silicate $4MgO.\ 3SiO_2\ 6H_2O$

DIAMOND — It has been estimated that about 15% of diamonds are fluorescent. It has no apparent effect on daytime brilliance. Colorless, no distinction between fluorescent and non-fluorescent stones. Provides a possible means for identification.

Locations: South Africa
S. W. fl: Blue to white to cream. Rarely green to orange.
L. W. fl: Blue to white to cream. Rarely green to orange.
Phos: -
Hardness: 10 Sp. gr: 3.42 - 3.50
Chem. comp: Carbon C.

DIOPSIDE — Small greenish or tan masses or grains can be distinguished in the lighter colored limestone.

Locations: Franklin, N. J.; Newcomb, N. Y.; Bancroft, Ont., Canada; Tuscon, Ariz.; etc.
S. W. fl: Blue-white to cream-white
L. W. fl: -
Phos: -
Hardness: 5 - 6 Sp. gr: 3.3 - 3.5
Chem. comp: Silicate of calcium and magnesium $CaO.\ MgO.\ 2SiO_2$

DOLOMITE — Fluorescence is probably due to an impurity as dolomite is rarely fluorescent. A white colorless carbonate such as white marble which is the type most likely to fluoresce.

Locations: Lake Co., Calif.; Bloomington, Ind.; Kern Co., Calif.; etc.
S. W. fl: White to blue
L. W. fl: -
Phos: Faint white
Hardness: 3-1/2 - 4 Sp. gr: 2.9 - 2.8
Chem. comp: Calcium magnesium carbonate $Ca\ CO_3\ MgCO_3$

DUMORTIERITE — Found in several localities in San Diego Co., California. A fibrous violet-pink. After heating the fluorescence is blue.

Locations: Alpine, Calif.; Dehesa, Calif.; etc.
S. W. fl: Purple to bluish
L. W. fl: -
Phos: -
Hardness: 7 Sp. gr: 3.36 - 3.26
Chem. comp: A basic aluminum borosilicate. $Al_8B\ Si_3O_{19}(OH)$

ELATERITE — Sometimes gummy and may stick to fingers. A dark brown hydrocarbon.

Locations: Utah
S. W. fl: Brown
L. W. fl: Dark brown
Phos: -
Hardness: Soft Sp. gr:
Chem. comp: A hydrocarbon

ESPERITE — Found only at Franklin, N. J. It came from deep levels of the mine and is now available only from dealers or old collections. Has been re-named to avoid association with larsenite. Cream to whitish.

Locations: Franklin, N. J.
S. W. fl: Yellow
L. W. fl: Paler yellow, sometimes
Phos: -
Hardness: 5 Sp. gr: 4.42
Chem. comp: Silicate of zinc, lead and calcium $(Pb, Ca)O, ZnO.\ Si\ O_2$

EUCRYPTITE — Often coated with petalite which fluoresces white. An alteration from spodumene. Sugary white appearance. Translucent to waxy.

Locations: Bikito, So. Rhodesia, Africa; Keystone, S. Dak.; Stafford, N. Hamp.; etc.
S. W. fl: Cerise red to begonia rose pink
L. W. fl: -
Phos: -
Hardness: 6 Sp. gr: 2.67
Chem. comp: Lithium aluminum silicate $Li_2O\ AL_2O_3 2SiO_2$

FLUORITE — Fluorite was the first fluorescent mineral discovered and gave its name to the subject of fluorescence. Glows when heated. Has many fluorescent colors and blue fluorescence responds best to L. W. but colors other than blue are often as bright with S. W.

Locations: Marion, Ky.; Clay Center, Ohio; Rosiclare, Ill.; Castle Dome, Ariz.; Cumberland, Eng.; Franklin, N. J.; New Mex.; Wash.; Conn.; Colo.; etc.
S. W. fl: White, Cream, blue, blue-green
L. W. fl: White, cream, blue, blue-green
Phos: Seldom but fairly strong at times
Hardness: 4 Sp. gr: 3.25 - 3.01
Chem. comp: Calcium fluoride CaF_2

GYPSUM — See Selenite

HACKMANITE — A rare and interesting type of rock which will change visible color by action of S. W. ultraviolet. The color of the rock is gray in ordinary light but after exposure to S. W. lengths it becomes a raspberry purple which fades back to gray on exposure to daylight. This is known as reversible photo sensitivity. When freshly cut the hackmanite in the rock is raspberry purple but fades to gray which is the normal color.

Locations: Bancroft, Ont., Canada
S. W. fl: Light pink
L. W. fl: Apricot-pink
Phos: -
Hardness: 5 - 5.5 Sp. gr: 3.33
Chem. comp: Complex silicate of sodium aluminum with chlorine. $3Na_2O.\ 3Al_2O_3\ 6SiO_2\ 2NaCl(S)$

HALITE — This salt is the same as table salt but has a trace of copper to impart the red fluorescence. The brines from dry lake at Amboy and Salton Sea precipitate crystals with beautiful fluorescence. Colorless to white. Also reddish.

Locations: Amboy, Calif.; Salton Sea, Calif.; etc.
S. W. fl: Pink to red
L. W. fl: -
Phos: -
Hardness: 2-1/2 Sp. gr: 2.53
Chem. comp: Sodium Chloride Na Cl

HANKSITE — Recovered from the deposits in Searles Lake and other dry saline deposits. Tastes salty. Usually white to yellowish. May occur as a short, fat, six-sided prism.

Locations: Searles Lake, Calif., etc.
S. W. fl: Dull yellow to light blue
L. W. fl: -
Phos: Light blue
Hardness: 3-3-1/2 Sp. gr: 2.56
Chem. comp: A carbonate sulphate of sodium. $HNa_2SO_4Na_2CO_3$

HARDYSTONITE — The fluorescence must be distinguished from blue reflection. In good specimens it is a beautiful fluorescent blue - associated with other bright colors of the Franklin minerals.

Locations: Franklin, N. J.
S. W. fl: Strong blue
L. W. fl: Rarely blue
Phos: -
Hardness: 3 - 4 Sp. gr: 3.40
Chem. comp: Calcium zinc silicate $2CaO.\ ZnO\ 2SiO_2$

HEMIMORPHITE — (Calamine) Is seldom fluorescent. Is white to blue but sometimes copper stains cause colors blue to greenish. Often occurs in lumpy masses, sometimes mixed with smithsonite. Heated samples fluoresce bright orange in L. W. & white S. W.

Locations: Superior, Ariz.; Silver City, N. Mex.; etc.
S. W. fl: Cream to white, orange to yellow
L. W. fl: Pale orange - whitish
Phos: Faintly
Hardness: 4-1/2 - 5 Sp. gr: 3.5 - 3.4
Chem. Comp: Hydrous silicate of zinc $Zn\ SiO_3\ Zn(OH)_2$

HERDERITE — White, yellowish or bluish green. Fluorescence is most marked and more common after heating.

Locations: New England pegmatites, etc.
S. W. fl: -
L. W. fl: Deep blue
Phos: -
Hardness: 5 -5.5 Sp. gr: 2.9 - 3.0
Chem. comp: Fluorophosphate of beryllium and calcium $CaBe\ (PO_4)\ (OH, F)$

HOWLITE — Small rounded nodules that are cauliflower shaped. Brownish spots on nodules are most apt to be fluorescent.

Locations: Lang, Calif., etc.
S. W. fl: Brown to yellow
L. W. fl: -
Phos: -
Hardness: 3-1/2 Sp. gr: 2.59 - 2.55
Chem. comp: Hydrous calcium silico-borate $4CaO.\ 5B_2O_3\ 2SiO_2\ 5H_2O$

HYALITE OPAL — One of the most common of all fluorescent minerals. This hyalite variety of opal is transparent to translucent with a bright green fluorescence due to a trace of a uranium salt. Occurs as a coating or in seams. Commonly occurs in fractures in pegmatites, granites, and feldspar. Usually colorless to white in ordinary light.

Locations: New England to Pacific Coast
S. W. fl: Bright green
L. W. fl: Faint green
Phos: -
Hardness: 5-1/2 - 6-1/2 Sp. gr:
Chem. comp: Silicon dioxide containing water $Si\ O_2\ (H_2O)n$

HYDROMAGNESITE — A white daytime appearance. Small needle-like crystals. Brittle.

Locations: Lodi, N. J.; San Benito County, Calif.; etc.
S. W. fl: Occasionally green
L. W. fl: -
Phos: Light blue
Hardness: 3-1/2 Sp. gr: 2.18 - 2.14
Chem. comp: Basic hydrous magnesium carbonate $3MgC\ O_3Mg(OH)_2\ 3H_2O$

HYDROZINCITE — A white to gray secondary zinc mineral. Has same fluorescent color as scheelite but is softer and lighter in weight. Sometimes powdery. Sometimes occurs as a white crusty coating.

Locations: Goodsprings, Nev.; Franklin, N. J.; Hurricane, Utah; etc.
S. W. fl: Blue, blue-white
L. W. fl: -
Phos: -
Hardness: 2 - 2-1/2 Sp. gr: 3.8 - 3.53
Chem. comp: Hydrous zinc carbonate $ZnCO_3\ 2Zn\ (OH)_2$

IDRIALITE (Curtisite) A rare hydrocarbon found in mercury mines in California. Occurs in thin vein form - glassy - yellow color to pistachio green. Best fluorescence under L. W.

Locations: Skaggs Springs, Calif.; New Idria, Calif.; etc.
S. W. fl: Yellow, green
L. W. fl: Yellowish-green
Phos: -
Chem. comp: A rare hydrocarbon

INYOITE One of the borax minerals from Death Valley. Has more of a phosphorescence than fluorescence.

Locations: Death Valley, Calif.
S. W. fl: Pale white
L. W. fl: White
Phos: White
Hardness: 2 Sp. gr: 1.87
Chem. comp: Hydrous calcium borate $2CaO.\ 3B_2O_3 13H_2O$

KUNZITE (spodumene) A pink colored spodumene. Usually in crystal form; translucent. Some crystals may hold phos. for hours.

Locations: Pala, Calif., etc.
S. W. fl: Pale yellow to reddish yellow
L. W. fl: -
Phos: Reddish yellow
Hardness: 7 Sp. gr: 3.2 - 3.13
Chem. comp: Lithium and aluminum silicate. $Li_2O.\ Al_2O_3\ 4SiO_2$

KYANITE Usually a blue color, long flat bladed crystals. Found in schists and gneisses.

Locations: Various locations; Korea; No. Carolina; etc.
S. W. fl: Occasionally red, sometimes cream
L. W. fl: Occasionally red
Phos: -
Hardness: 4-1/2 along the crystal 7 across the crystal
Sp. gr: 3.60
Chem. comp: Aluminum silicate Al_2SiO_5

LEPIDOLITE Purple, red (rose), yellowish or gray. Not fluorescent as a general rule but upon heating fuses to glass and fluoresces blue or pinkish.

Locations: Keystone, S. Dakota, etc.
S. W. fl: Pale green
L. W. fl: -
Phos: -
Hardness: 2-1/2 - 4 Sp. gr: 2.9 - 2.8
Chem. comp: Hydrous potassium lithium and aluminum silicate. $(K, Li)_2OAl_2O_2 3SiO_2$ with F.

LIMESTONE Found in every part of the country. It is the same as calcite but not crystallized. Has the same fluorescent responses which in all cases are due to minor impurities. Much of limestone is non-fluorescent but many possess a rainbow of colors from the trace elements that are present and serve as activators.

Locations: Atlantic to Pacific
S. W. fl: Orange, yellow, cream, green or blue
L. W. fl: Orange, yellow, cream, green or blue
Phos: Often
Hardness: 3 - 3-1/2 Sp. gr: 2.9 - 2.8
Chem. comp: Calcium carbonate $Ca\ CO_3$

MAGNESITE Daylight color is white to brown. Some of the granular variety resembles marble, but softer.

Locations: Found in veins from alteration of serpentine in limestone, dolomite and schists.
S. W. fl: Slightly
L. W. fl: Bluish or greenish white, sometimes yellowish white
Phos: -
Hardness: 3-1/2 - 4-1/2 Sp. gr: 3.12 - 3.0
Chem. comp: Magnesium carbonate $Mg\ CO_3$

MANGANAPATITE Usually found in pegmatites or as scattered grains in feldspar. A deposit in California contains some gallium. In Connecticut it is associated with autunite or hyalite. Appears dull green, brown or white in daylight.

Locations: Hazardville, Conn.; McCall, Ida.; Valyermo, Calif.; St. Marys Lake, B. C. Canada; etc.
S. W. fl: Yellowish orange to buff brown
L. W. fl: Bright yellow
Phos: -
Hardness: 5 Sp. gr: 3.26
Chem. comp: A variety of apatite or calcium phosphate in which part of the calcium has been replaced by manganese.
$9(CaM_3)O\ 3P_2O_5\ Ca(OH, F)_2$

MARGAROSANITE A very rare mineral found in the early operations of the zinc mine at Franklin, N. J. Daylight appearance is white to transparent with plates of a pearly luster.

Locations: Franklin, N. J.
S. W. fl: Soft blue-white to violet
L. W. fl: -
Phos: -
Hardness: 3 Sp. gr: 3.99
Chem. comp: A silicate of lead, calcium and manganese.
$Pb\ O\ 2(Ca\ Mn)O\ 3SiO_2$

MARIALITE (scapolite) A scapolite mineral not always fluorescent but when fluorescent this offers an easy method of identification. After heating fluorescence yellower and brighter.

Locations: Ludwig, Nev.; French Creek, Penna.; etc.
S. W. fl: Pink
L. W. fl: Orange to bright yellow
Phos: -
Hardness: 3-1/2 - 6 Sp. gr: 2.56
Chem. comp: A silicate of sodium and aluminum
$Na_4Al_3(AlSi)_3\ Si_6O_{24}\ (Cl,\ CO_3, SO_4)$

MERCURY — Quicksilver. It is not fluorescent but its presence is readily determined with the MINERALIGHT Lamp and a Willemite Screen. This easy test is fully described in a separate information sheet available from MINERALIGHT dealers of Ultra-Violet Products, Inc., San Gabriel, California.

Locations: California, Nevada, Idaho, etc.
S. W. fl: Seen by absorption, not fluorescent
L. W. fl: -
Phos: -
Hardness: Liquid Sp. gr: 13.59
Chem. comp: Mercury Hg.

MEYERHOFFERITE — Found in the borax deposits of Death Valley, Calif. Daytime appearance is dull white.

Locations: Death Valley, California
S. W. fl: Yellow-white
L. W. fl: Faintly
Phos: Yellow-white
Hardness: 2 Sp. gr: 2.12
Chem. comp: Hydrous calcium borate $2Ca\,O\,3B_2O_3\,7H_2O$

MICROCLINE — Daytime appearance is green to grayish green or yellow. It is one of the little known fluorescent minerals from Franklin, N. J. although found in several areas in the Western U. S. where the fluorescence is quite similar.

Locations: Franklin, N. J.; Llano County, Texas; etc.
S. W. fl: Bluish white to cream white
L. W. fl: -
Phos: -
Hardness: 6 Sp. gr: 2.57 - 2.54
Chem. comp: Potassium, aluminum silicate $K_2O\,Al_2O_3 6SiO_2$

MISERITE — This mineral is probably the rarest authenticated fluorescent mineral discovery of recent years. It has been found only in the Hot Springs, Ark. area but is known in 1 or 2 areas of Russia. In normal light, it is pink to lavender color and occurs with wollastonite, a white fibrous calcium silicate, and aegirine, a dark green sodium iron pyroxine mineral. While miserite is an extremely rare mineral, its commercial importance seems to stem from the fact that it is associated with rare earth minerals of a non-fluorescent nature. Research is being done to explain its association with the rare earth minerals. Some specimens have the typical green response of the rare earths with unfiltered ultraviolet. It seldom occurs pure, although layers up to 1" thick have been found. Its structure is foliated, crystallization is almost unknown, and it appears to be a secondary mineral replacing wollastonite. Miserite was known to local collectors for several years but its fluorescent nature was only recently discovered. The wollastonite fluoresces lavender pink to dull red under LW with a dull orange phosphorescence both LW and SW. The miserite fluoresces cream to cream-yellow with a slight greenish cast under SW. The miserite is non-fluorescent under LW. The 2 minerals occur together in most specimens. Miserite was named for Dr. Hugh D. Miser, a prominent Arkansas geologist with the U. S. Geological Survey.

Locations: Magnet Cove & Wilson Springs, Ark.
S. W. fl: Red to pinkish
L. W. fl: None
Phos: Orange
Hardness: 3
Chem. comp: A rare silicate $KCa_4\,Si_5O_{13}(OH)_3$

NATROLITE — Daytime color white to yellow-gray. Found in several localities in Europe and U. S. Found as a lining in cavities in rocks. After heating will usually fluoresce greenish white or blue.

Locations: Various mineralized areas.
S. W. fl: Orange to yellowish white
L. W. fl: -
Phos: -
Hardness: 5 - 5-1/2 Sp. gr: 2.25 - 2.2
Chem. comp: Hydrous sodium aluminun silicate $Na_2Al_2Si_3O_{10}\,2H_2O$

NEPHELINE — Fluorescent in portions of crystals although the usual occurance is in massive form with daytime color of brown to brick red. Has no cleavage.

Locations: Bancroft, Ont., Canada
S. W. fl: Orange, red
L. W. fl: -
Phos: -
Hardness: 6 Sp. gr: 2.65 - 2.55
Chem. comp: Sodium potassium aluminum silicate $3(K, Na)_2O\,4Al_2O_2 9SiO_2$

NORBERGITE — Found in the limestone quarries in the Franklin area. Color is yellow-brown.

Locations: Franklin, N. J.
S. W. fl: Yellow to brownish-yellow
L. W. fl: -
Phos: -
Hardness: 6 Sp. gr: 3.14
Chem. comp: Fluorosilicate of magnesium. $3MgO\,SiO_2\,H_2O+F$

OPAL (Semi-Opal) — The fluorescence of common opal is due to a trace of a uranium salt, the same as hyalite opal. The fluorescence is yellow green, the color in daylight is usually yellowish gray to white or brown. Fire opal does not fluoresce. The best fluorescent opal is from Virgin Valley, Nevada but other localities have varieties that are brightly fluorescent.

Locations: Virgin Valley, Nev.; Alpine, Texas; Lovington, N. Mex.; Big Fork, Montana; etc.
S. W. fl: Bright green to dull green
L. W. fl: Yellow-green
Phos: Seldom
Hardness: 5-1/2 - 6-1/2 Sp. gr: 2.3 - 1.9
Chem. comp: Hydrous silica or silicon dioxide $Si\,O_2N\,H_2O$

OPALIZED WOOD — Many deposits of petrified wood have opalized deposits of silica with traces of uranium salt which provide a varying degree of fluorescence. This is invariably green. Some petrified wood has brown and yellow fluorescence due to other activators.

Locations: Eden Valley, Wyo.; Goldfield, Nev.; Huntsville, Tex.; etc.
S. W. fl: Green
L. W. fl: Light green
Phos: Seldom
Hardness: 5-6 Sp. gr:
Chem. comp: Hydrous silica $Si\,O_2\,n\,H_2O$

PEARLS

The native and cultured pearls often fluoresce due to manganese as a trace element, (few molecules per million) and has no effect on their value. Artificial pearls, as a rule, do not fluoresce.

Locations: Native or cultured
S. W. fl: Shades of white
L. W. fl: Shades of white
Phos: -
Hardness: - Sp. gr:
Chem. comp: Calcium carbonate

PECTOLITE

Occurs in fibrous masses or fanned xls which are usually white to gray and sometimes yellowish in daylight. Many specimens show bright orange-yellow fluorescence. In others, the fluorescence is not bright but there is a bright momentary phosphorescence. After fusing it loses all LW fluorescence but fluoresces SW white.

Locations: Lake County, Calif.; Paterson, N. J.; Magnet Cove, Ark.; Franklin, N. J.; etc.
S. W. fl: Orange to yellow
L. W. fl: Orange (seldom)
Phos: Strong
Hardness: 5 - 6 Sp. gr: 2.76 - 2.68
Chem. comp: Hydrous calcium and sodium silicate. $Ca_2NaSi_3O_8(OH)$

PETALITE

Daylight color is usually white to gray resembling spodumene. Is usually associated with eucryptite which fluoresces red SW and frequently occurs as a coating which covers the bright red fluorescence of the eucryptite.

Locations: Bonneville, Wy.; Greenwood, Me.; Bikito, So. Rhodesia, Africa; etc.
S. W. fl: Cream to white
L. W. fl: Faint
Phos: -
Hardness: 6 - 6-1/2 Sp. gr: 2.46 - 2.39
Chem. comp: Lithium aluminum silicate $Li_2O\,Al_2O_3\,8SiO_2$

PETROLEUM

Most natural oils have a fluorescent response. Oils from different strata may fluoresce different shades of color and the color also varies with the gravity of the oil. Oil products such as kerosene, paraffin, vaseline and medical ointments also fluoresce. Lubricating oils usually have a fluorescent additive which serves as a "bloom". Highly refined oils don't fluoresce.

Locations: All natural petroleum.
S. W. fl: Blue to bright yellow, Brown
L. W. fl: Blue to bright yellow
Phos: -
Hardness: liquid
Chem. comp: Hydrocarbon

PHLOGOPITE

A magnesium mica commonly found in the middle Atlantic and New England areas. It is typically found in limestones as flakes and crystals. Daylight appearance is yellowish brown to reddish.

Locations: Franklin, N. J.; Newcomb, N. Y.; Northeastern U. S.; etc.
S. W. fl: Buff yellow to pale yellow, never strong, seen only from certain angles and on only some specimens.
L. W. fl: -
Phos: -
Hardness: 2-1/2 - 3 Sp. gr: 2.85 - 2.78
Chem. comp: A silicate of magnesium potassium and aluminum. $2K_2O.10(MgFe)O\,3Al_2O_3\,12SiO_2\,3H_2O$

PHOSGENITE

Daylight appearance white to yellowish brown. Found only in the ore bodies of lead mines.

Locations: Associated with lead in many ore bodies.
S. W. fl: Yellow to orange
L. W. fl: -
Phos: Red
Hardness: 2-1/2 - 3 Sp. gr: 6.1 - 6.0
Chem. comp: Chlorocarbonate of lead. $Pb_2(CO_2)Cl_2$

POWELLITE

Daylight appearance is usually yellowish but varies to almost black. Is an alteration product of molybdenum but is easily distinguished by the softer structure. It is also often powdery and frequently occurs as a coating over the face of crystals of molybdenum.

Locations: Beaver, Utah; Lordsburg, N. Mex.; Coaldale, Nevada; etc.
S. W. fl: Yellow
L. W. fl: -
Phos: -
Hardness: 3-1/2 - 4 Sp. gr: 4.53
Chem. comp: A double salt of calcium molybdate and calcium tungstate. $Ca(MO,W)O_4$

PRICEITE

One of the many borax minerals from Death Valley, Calif. which has a mild fluorescence.

Locations: Death Valley, Calif.
S. W. fl: Yellowish
L. W. fl: -
Phos: -
Hardness: 2 - 3 Sp. gr: 2.4
Chem. comp: Hydrous calcium borate $4CaO\,5B_2O_3\,7H_2O$

QUARTZ

Quartz crystals usually do not fluoresce but melted down to make tubing and quartz-ware often has a bluish white fluorescence and phosphorescence. Smoky quartz sometimes has a brownish fluorescence. Other forms of quartz such as chalcedony and agate very often have a beautiful green fluorescence due to uranium salts as an activator. Some moss agates are far more beautiful by fluorescence than in daylight.

Locations: Nationwide
S. W. fl: Bluish white
L. W. fl: -
Phos: Slightly
Hardness: 7 Sp. gr: 2.65
Chem. comp: Silicon Dioxide SiO_2

RUBELLITE (Tourmaline) A red tourmaline

Locations: Pala, Calif.; Newry, Maine; etc.
S. W. fl: Lavender, violet
L. W. fl: -
Phos: -
Hardness: 7 - 7-1/2 Sp. gr: 3.2 - 3.98
Chem. comp: Complex silicate of boron and aluminum and lithium.

RUBY (Corundum) Often appears red in daylight with a bright clear red fluorescence that is best under long wave. Found in small crystals in U.S. Large rubies from Siam have weak fluorescence. The synthetic ruby has a much more brilliant fluorescence than the natural ruby.

Locations: Northern New Jersey and North Carolina
S. W. fl: Faint red
L. W. fl: Bright ruby red
Phos: -
Hardness: 9 Sp. gr: 4.1 - 3.95
Chem. comp: Aluminum oxide Al_2O_3

SAPPHIRES These gem stones frequently have an orange-ish to yellowish fluorescence. This is typical for both natural and synthetic sapphires, especially the colorless varieties.

Locations: Various
S. W. fl: Yellow-orange to red
L. W. fl: -
Phos: -
Hardness: 9 Sp. gr: 4.1 - 3.95
Chem. comp: Aluminum oxide Al_2O_3

SASSOLITE Daylight color is white to yellowish in flat crystals. Is found in hot springs, borax deposits and volcanic regions.

Locations: A rare mineral found in Borax deposits.
S. W. fl: Blue
L. W. fl: -
Phos: -
Hardness: 1 Sp. gr: 1.48
Chem. Comp: Natural boric acid. $B_2O_3\ 3H_2O$

SATIN SPAR (Gypsum) See Selenite

SCAPOLITE See Wernerite

SCHEELITE Scheelite is commercially the most important of all fluorescent minerals. Well in excess of $100,000,000 of tungsten values have been found with the MINERALIGHT lamp. The fluorescence of pure calcium tungstate or scheelite is a bright lustrous blue. The crystals have sharp well defined edges with the matrix. As impurities develop in the ore the fluorescent color becomes white to cream to yellow. The most common impurity is molybdenum, but sometimes copper or excess amounts of calcite are present. Shadings of blue to yellow quite common but always with well defined terminations between the ore and matrix. Usually occurs in small masses that are not seen except by fluorescence. They vary from a pin point to a pound or more in size but the average is slightly larger than the size of a pea. Most ore samples can only be seen by fluorescence.

Locations: Atolia, Calif.; Bishop, Calif.; and widely scattered deposits in Arizona, Nevada, Idaho, New Mexico, Montana, Canada, Conn. and South Carolina.
S. W. fl: Blue to white, Cream to yellow
L. W. fl: -
Phos: -
Hardness: 4-1/2 - 5 Sp. gr: 6.1 - 5.9
Chem. comp: Calcium tungstate $Ca\ WO_4$

SCHROECKINGERITE Very soft and powdery. Is found mainly in clays and lake beds. Daytime appearance is yellowish.

Locations: Wamsutter, Wyo.; Taft, Calif.; etc.
S. W. fl: Yellow-green
L. W. fl: Yellow-green
Phos: -
Hardness: 1-1/2 - 2 Sp. gr: 2.51
Chem. comp: A hydrous sulfate and carbonate of calcium sodium and uranium. $3\ Ca\ CO_3Na_2\ SO_4 \cdot UO_3\ 10H_2O$

SELENITE (Gypsum) Commonly occurs in transparent to white to yellow plates or crystals. Many have various impurities which account for a fluorescence which varies from white to yellow to blue. Often fluorescent LW as well as SW. Is usually very phosphorescent.

Locations: Lovington, New Mex.; Yermo, Calif.; Newport, Calif.; Fort Dodge, Ia.; etc.
S. W. fl: Pale yellow to bluish white
L. W. fl: Pale yellow to bluish white
Phos: Pale yellow to bluish white
Hardness: 1.5 - 2 Sp. Gr: 2.32
Chem. comp: A form of Gypsum $Ca\ SO_4\ 2H_2O$

SERPENTINE This rather common mineral is not often fluorescent but when fluorescent does so best under LW. Daytime appearance is usually a mottled green but may also be other colors such as yellow which is the one most likely to fluoresce.

Locations: Lancaster County, Pa.; Crestmore, Calif.; Conejos, Colo.
S. W. fl: Faint yellowish-cream white
L. W. fl: Yellowish to white
Phos: -
Hardness: 2-1/2 - 4 Sp. gr: 2.65 - 2.5
Chem. comp: A hydrous manganese silicate $3MgO\ 2SiO_2\ 2H_2O$

SMITHSONITE

Not very often found to be fluorescent. A few localities and mines have some smithsonite that is fluorescent and in some cases there has been a coating of fluorescent yellow greenockite on the smithsonite. All such cases of fluorescence are unusual.

Locations: Cerro Gordo Mine, Inyo County, Calif.; Marion County, Georgia; etc.
S. W. fl: Dull white to bluish or greenish white
L. W. fl: Faint
Phos: -
Hardness: 5 Sp. gr: 4.45 - 4.30
Chem. comp: Zinc carbonate $Zn\ CO_3$

SODALITE

A gray to yellowish or blue appearing rock most easily seen under long wave by its very distinctive fluorescence. Never associated with quartz type rocks.

Locations: Moultonboro, N. H.; Beemerville, N. J.; etc.
S. W. fl: Faint dull pink
L. W. fl: Yellow-brown to orange-red
Phos: -
Hardness: 5 - 6 Sp. gr: 2.3 - 2.14
Chem. comp: Sodium, aluminum silicate with chlorine $3NaAlSiO_2\ Na\ Cl$

SPHALERITE

A zinc mineral that may be yellowish to brown or black. Also silvery from Franklin. Many deposits contain wertzite and such specimens are not only fluorescent to LW and SW but are also tribolumenscent (spark when scratched). Response to ultraviolet is often very uneven fluorescence with specimens showing large variation in color and brightness. Best fluorescence with long wave. Sometimes blue fluorescence is associated with sphalerite and this is from the nasonite that may be present.

Locations: Franklin, N. J.; Milford, Utah; Iturbidie District, Mexico; Tsumeb, So. Africa; Bisbee, Ariz.; etc.
S. W. fl: Orange, yellow, greenish gold
L. W. fl: Orange, yellow, greenish, bright blue
Phos: Often strong orange
Hardness: 3-1/2 - 4 Sp. gr: 4.1 - 3.9
Chem. comp: Zinc sulphide Zn S

SPINEL

Only the red spinel is fluorescent. This gem stone from either Vesuvious or Ceylon has a bright red fluorescence. Only other color to respond is the lilac colored spinel which will fluoresce yellow green.

Locations: Gem localities
S. W. fl: Faint
L. W. fl: Bright red, yellow-green
Phos: -
Hardness: 8 Sp. gr: 4.1 - 3.5
Chem. comp: Magnesium aluminum oxide $(Mn\ Fe\ Na_2\ K_2)\ O\ (AlFe)_2\ O_3$

SPODUMENE

The crystals of spodumene like those of kunzite often have a yellow to orange fluorescence. If the light is applied very close to the crystal and left for a few minutes they will often pick up a charge of energy and release the phosphorescent light over quite a period of time. This persistance will sometimes exceed an hour in length if checked under totally dark conditions. Fused material fluoresces blue SW.

Locations: Branchville, Conn.; Taos, New Mex.; Pennington Co., S. D.
S. W. fl: Usually faint orange
L. W. fl: Orange-yellow to white
Phos: Persistent
Hardness: 6-1/2 - 7 Sp. gr: 3.2 - 3.13
Chem. comp: Lithium and aluminum silicate $Li\ Al\ Si_2\ O_6$

STEATITE

Commonly called soapstone, this variety of talc is not often fluorescent but some deposits contain an impurity which cause the rock from that locality to have a distinctive fluorescent response.

Locations: Northern Utah; White Mts., Calif.; etc.
S. W. fl: Dull white
L. W. fl: Cream
Phos: -
Hardness: 1 - 1-1/2 Sp. gr: 2.8 - 2.7
Chem. comp: Variety of talc $3MbO\ 4SiO_2\ H_2\ O$

STOLZITE

A rare secondary mineral found in ore bodies. It is distinguished in the ore bodies by the fluorescence which is greenish white.

Locations: Chester County, Penna.; Southampton, Mass.; Dragoon, Ariz.; Lucin, Utah; etc.
S. W. fl: Bright greenish-white
L. W. fl: -
Phos: -
Hardness: 2-1/2 - 3 Sp. gr: 8.13 - 7.87
Chem. comp: Lead Tungstate $Pb\ WO_4$

STRONTIANITE

Mineral is massive. Not always fluorescent but usual response is a mottled cream to white and sometimes a pale yellow.

Locations: California; Schoharie County, N. Y.; etc.
S. W. fl: White to cream, blue
L. W. fl: -
Phos: slightly
Hardness: 3-1/2 - 4 Sp. gr: 3.71 - 3.68
Chem. comp: Strontium carbonate $Sr\ C\ O_3$

SVABITE

Svabite is a form of apatite of the arsenic group. It may be grayish in daylight (altered svabite). The finest specimens are associated with the ore minerals and are green in color. It has been found only in the mines of Franklin, N. J. and is one of the rare fluorescent minerals from that area that will never again be made available, due to the closing of the mines.

Locations: Franklin, N. J.
S. W. fl: Pinkish orange
L. W. fl: -
Phos: -
Hardness: 4-1/2 - 5 Sp. gr: 3.8 - 3.5
Chem. comp: A fluor-arsenate of calcium $9CaO\ 3(As_2O_5\ P_2O_5)\ Ca\ (F\ OH)_2$

TALC

Feels smooth and greasy. Can be cut with a knife. Not always fluorescent but from the listed localities has a variable fluorescence under short wave.

Locations: Balmat, N. Y.; Talcaville, N. Y.; White Mountains, Calif.; Silver Lake, Calif.; etc.
S. W. fl: Greenish-white, cream-white
L. W. fl: -
Phos: -
Hardness: 1 - 1-1/2 Sp. gr: 2.8 - 2.7
Chem. comp: A magnesium metasilicate $3MgO\ 4SiO_2\ H_2O$

TERLINGUAITE

A rare mercury mineral found in the deposits at Terlinqua, Texas. Daylight appearance is greenish yellow to brown with yellow fluorescence short wave only.

Locations: Terlingua, Texas
S. W. fl: Yellow
L. W. fl: -
Phos: -
Hardness: 2-1/2 Sp. gr: 8.725
Chem. comp: Oxychloride of mercury $Hg\ 2\ O\ Cl$

THAUMASITE

Found in quarry rock as a coating or in cleavage.

Locations: Paterson, N. J.
S. W. fl: White
L. W. fl: -
Phos: White
Hardness: 3.5 Sp. gr: 1.88
Chem. comp: Hydrous silicates, carbonate and sulphate of calcium $Ca\ SiO_3\ Ca\ CO_3\ CaSO_4\ 15H_2O$

THENARDITE

Daylight color translucent to white to pale yellow. Often phosphoresces as well as being fluorescent. Upon heating becomes fluorescent white to SW.

Locations: Nogales, New Mex.
S. W. fl: Faint
L. W. fl: Yellow green
Phos: Yellow
Hardness: 2-1/2 Sp. gr: 2.69 - 2.68
Chem. comp: A sodium sulphate $NA_2\ SO_4$

TOPAZ

Most gemstones of topaz have some fluorescence except the pinkish stones which are seldom fluorescent. The fluorescent response is not sufficiently consistent to be a positive test.

Locations: Gem deposits
S. W. fl: Light green to cream to golden yellow.
L. W. fl: -
Phos: Slightly
Hardness: 8 Sp. gr: 3.65 - 3.4
Chem. comp: Aluminium fluo-silicate $Al_2\ O_3\ (OH, F)\ Si\ O_2$

TOURMALINE

Only the light yellow shades exhibit any fluorescence and these to only a slight degree. Black and brown varieties contain iron which quenches fluorescence.

Locations: Various
S. W. fl: Pale light yellow
L. W. fl: -
Phos: -
Hardness: 7 - 7-1/2 Sp. gr: 3.2 - 3.98
Chem. comp: Borosilicate of K, Li, Mg, Fe, and Al

TREMOLITE

Associated with talc. The fluorescent colors vary greatly in a single specimen. Some varieties fluoresce apricot to red with all shades inbetween. Others fluoresce simply a blue or greenish white. The variety of colors is not vivid but often make beautiful combinations. Franklin tremolite is found only in the quarry limestone in roughly rectangular "blocks." It fluoresces only SW - a blue to blue-white.

Locations: Balmat, N. Y.; Lee, Mass.; Yerington, Nev.; Franklin, N. J.
S. W. fl: Apricot-pink to orange, red, blue-white
L. W. fl: Apricot-pink to orange, red, blue-white
Phos: Apricot-pink to orange, red, blue-white
Hardness: 5 Sp. gr: 3.1 - 2.9
Chem. comp: Calcium magnesium silicate $2CA\ O.\ 5MgO,\ 8SiO_2\ H_2O$

TRONA

Can often be distinguished by the intense zonal fluorescence parallel to the major axis. There is also a difference in fluorescence between wet and dry crystals. When wet the fluorescence is greenish-blue and dry, it is blue-white. Usually phosphorescent.

Locations: Searles Lake, Calif.; Green River, Utah; etc.
S. W. fl: Faint green, blue, blue-white or pale yellow
L. W. fl: Faint green, blue, blue-white or pale yellow
Phos: Faint green, blue, blue-white or pale yellow
Hardness: 2-1/2 - 3 Sp. gr: 2.14 - 2.11
Chem. comp: Hydrous carbonate and bicarbonate of sodium $Na_2CO_3\ Na\ H\ CO_3\ 2\ H_2O$

ULEXITE — Commonly called "Cotton Balls." Found in desert dry lakes, salt beds, borax areas. Rounded white masses that fluoresce white and phosphoresce white.

Locations:	Various
S. W. fl:	White
L. W. fl:	White
Phos:	Yellow, following flame tests.
Hardness:	1 Sp. gr: 1.65
Chem. comp:	Complex borate Na_2O 2CaO $5B_2O_3$ $16H_2O$

URANIUM SALTS AND MINERALS

Uranium is responsible for the fluorescence of a very large number of minerals. The characteristic color of uranium salts and minerals is a lemon-yellow or light green. It is probably some uranium salt that causes the fluorescence of most hyalite opals; also of many forms of chalcedony and some calcites. The following list of better known uranium minerals show practically identical fluorescent qualities. They are all secondary uraninites with little or no commercial value but they may appear as a coating on more valuable ores and this can be used to locate and assist in the mining of other ores. These uranium salts are widely scattered in other minerals as a fluorescent activator as well as fluorescent source by themselves. In the case of carnotite (non-fl) the cold borax bead is fluorescent green.

Mineral	Fluorescence
Autunite	Yellow green
Beta-Uranopilite	Yellow green
Beta-Uranotil	Yellowish
Chalcolite	Yellow green
Gummite (variable)	Violet
Johannite (variable)	Yellow green
Meta-Tobernite	Yellow blue
Schroeckingerite	Green
Torbernite	Yellow green
Uranocircite	Yellow green
Uraniferous hyalite	Yellow green
Uranophane	Yellow green
Uranospathite	Yellow green
Uranothallite	Green
Uranotil	Yellowish
Zippeite	Yellowish

Locations:	Widely scattered
S. W. fl:	Light lemon to yellow green
L. W. fl:	Sometimes
Phos:	-
Hardness	-
Chem. comp:	Uranium salts

WAVELLITE — Fluoresces only occasionally. The white varieties most often fluoresce and phosphoresce.

Locations:	Mt. Holly, Penna.; other areas.
S. W. fl:	Cream white to greenish-white or blue
L. W. fl:	Blue
Phos:	Blue
Hardness	3-1/2 - 4 Sp. gr: 2.34 - 2.32
Chem. comp:	Hydrous aluminum phosphate $4AlPO_4$ $2Al(OH)_3$ $9H_2O$

WERNERITE (Scapolite) — One of the brightest of fluorescent minerals, especially under LW. Has a more orange-yellow fluorescence under SW. Has a weak but long-lasting phosphorescence under both long wave and short wave. One of the most popular of all fluorescent minerals.

Locations:	Grenville, Que. Canada
S. W. fl:	Yellow, Orange-yellow
L. W. fl:	Yellow
Phos:	Yellow
Hardness:	5 - 6 Sp. gr: 2.73 - 2.66
Chem. comp:	Complex silicate of calcium, sodium and aluminum.

WILLEMITE — Willemite is the brightest of minerals under SW. In combination with other fluorescent minerals usually associated with it the willemite forms the most beautiful and spectacular of all fluorescent combinations. It is one of the several zinc ores mined in New Jersey. The fluorescence is due to manganese as an activator. When manganese is absent willemite does not fluoresce. The brightest green fluorescence occurs with percentages between 1% and 5% manganese, each degree of variation in the activator causing different shades of green fluorescence. The white willemite from Franklin is especially phosphorescent although the willemite from the Arizona locations is more apt to be phosphorescent. The daylight color is quite variable between green and black. There are many daylight colors, various shades of green being the most common; white, yellow, tan, brown, pink, red, "grape," black - even blue when mixed with cyprine. There is also a rare type from Sterling Hill that fluoresces (SW) yellow and phosphoresces yellow strongly.

Locations:	Franklin, N. J.; Casa Grande, Ariz.; Superior, Ariz.; New Mexico; etc.
S. W. fl:	All shades of green
L. W. fl:	Green
Phos:	Green
Hardness:	5-1/2 Sp. gr: 4.18 - 3.89
Chem. comp:	Zinc silicate Zn_2 Si O_4

WITHERITE — A rather rare mineral found mainly in the fluorite mines of Illinois. Daytime appearance grayish white to yellowish. Occurs in small masses seldom over a few inches in size. Very heavy. Highly prized for its rarity and fluorescence.

Locations:	Rosiclare, Ill.
S. W. fl:	Blue, white to cream
L. W. fl:	Blue, white to cream
Phos:	sometimes
Hardness:	3-1/2 Sp. gr: 4.35 - 4.28
Chem. comp:	Barium carbonate Ba CO_3

WOLLASTONITE

While most wollastonite is not fluorescent, the specimens that contain an impurity provide very beautiful colors under both LW and SW. The wollastonite from Franklin, N. J. is one of the most prized of all specimens from that famous locality. It was originally found in massive chunks and later in small spots associated with fluorescent calcite. Has a gray-white daytime color.

Locations: Crestmore, Calif.; Franklin, N. J.; Alaska; Penna.; etc.
S. W. fl: Golden-yellow, cream and brilliant, translucent orange
L. W. fl: Variable
Phos: -
Hardness: 4-1/2 - 5 Sp. gr: 2.9 - 2.8
Chem. comp: Calcium silicate $Ca\ Si\ O_3$

ZIRCON

The black sands of Northwest U.S. contain an appreciable percentage of small bright fluorescent grains of zirconium. They can be concentrated because of their very heavy weight. Gem quality is rarely fluorescent. Zirconium crystals and small masses have been found in Pacoima Canyon, Calif. with a bright yellow fluorescence. Daytime appearance is gray, yellow to brown. The fluorescence is believed due to the presence of the rare element hafnium as an activator.

Locations: Statesville, No. Car.; Pacoima, Calif.; Northern Calif.; Oregon; Idaho; etc.
S. W. fl: Bright orange, golden yellow and dull yellow
L. W. fl: -
Phos: -
Hardness: 7 - 7-1/2 Sp. gr: 4.82 - 4.2
Chem. comp: Zirconium silicate $Zr\ O_2\ Si\ O_2$

SHADES OF BLUE

MINERAL	MINERAL	MINERAL
Amber	Colomite	Microcline
Amethyst	Dumortierite	Petroleum
Aragonite	Fluorite	Quartz
Benitoite	Hanksite	Sassolite
Borax	Hardystonite	Scheelite
Brucite	Herderite	Selenite
Calcite	Hydromagnesite	Smithsonite
Caliche	Hydrozincite	Sphalerite
Deweylite	Limestone	Strontianite
Diamond	Magnesite	Trona
Diopside	Margarosanite	Wavellite
		Witherite

SHADES OF BROWN

Albite	Amblygonite	Manganapatite
Allophane	Elaterite	Norbergite
Amazonite	Howlite	Petroleum
		Sodalite

SHADES OF GREEN

Adamite	Caliche	Lepidolite
Agate	Celestite	Limestone
Albite	Chalcedony	Semi-Opal
Allophane	Cupro scheelite	Opalized Wood
Amazonite	Curtisite	Satin Spar
Amber	Fluorite	Schroeckingerite
Aragonite	Gypsum	Spinel
Autunite	Hyalite Opal	Stolzite
Beryl	Hydromagnesite	Topaz
Borax	Idrialite	Uranium Salts
		Willemite

SHADES OF ORANGE

Albite	Hemimorphite	Sapphires
Anglesite	Limestone	Sphalerite
Apatite	Manganapatite	Spodumene
Aragonite	Marialite	Svabite
Calcite	Natrolite	Tremolite
Caliche	Nepheline	Wernerite
Chlorapatite	Pectolite	Wollastonite
Clinohedrite	Phosgenite	Zircon

PURPLE (see last page)

SHADES OF RED

Apatite	Eucryptite	Nepheline
Aragonite	Hackmanite	Ruby
Axinite	Halite	Sapphires
Beryl	Kunzite	Sodalite
Calcite	Kyanite	Spinel
Calomel	Marialite	Tremolite
Corundum	Miserite	Wollastonite

CROSS INDEX COLOR CHART FOR IDENTIFICATION OF MINERALS FLUORESCING

SHADES OF WHITE

MINERAL	MINERAL	MINERAL
Albite	Diopside	Quartz
Allophane	Dolomite	Scheelite
Aluminite	Fluorite	Selenite
Alunite	Gypsum	Serpentine
Amazonite	Hemimorphite	Smithsonite
Amber	Hydrozincite	Spodumene
Amblygonite	Inyoite	Steatite
Anglesite	Kyanite	Stolzite
Aragonite	Limestone	Strontianite
Barite	Magnesite	Talc
Borax	Margarosanite	Thaumasite
Calcite	Meyerhofferite	Topaz
Caliche	Microcline	Tremolite
Celestite	Natrolite	Trona
Colemanite	Pearls	Ulexite
Dewylite	Petalite	Wavellite
Diamond		Witherite

SHADES OF YELLOW

Amber	Hemimorphite	Scheelite
Anglesite	Howlite	Schroeckingerite
Apatite	Idrialite	Selenite
Aragonite	Kunzite	Serpentine
Barite	Limestone	Sodalite
Calcite	Manganapatite	Sphalerite
Calcium Larsenite	Marialite	Spinel
Caliche	Meyerhofferite	Spodumene
Cerussite	Natrolite	Terlinguaite
Chondrodite	Norbergite	Thenardite
Chlorapatite	Pectolite	Topaz
Colemanite	Petroleum	Tourmaline
Cuproscheelite	Phlogopite	Tremolite
Curtisite	Phosgenite	Trona
Esperite	Powellite	Uranium Salts
Gypsum	Priceite	Wernerite
Hanksite	Sapphires	Wollastonite

SHADES OF VIOLET

Hardystonite	Margarosanite	Rubellite

SHADES OF PURPLE

Dumortierite

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